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EXAMINER	
MUTSCHLER, BRIAN L	

ART UNIT	PAPER NUMBER
1753	9

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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 10/035,107	Applicant(s) GONSIORAWSKI, RONALD C.
	Examiner Brian L. Mutschler	Art Unit 1753

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *04 March 2003* .

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *23,24,27,29,30 and 36-41* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *23,24,27,29,30 and 36-41* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on March 4, 2003 has been entered.

Comments

2. Applicant's cancellation of claims 25, 26, 28 and 31-35 in the response is noted.

3. The objection to the specification set forth in the Office action mailed December 6, 2002, has been overcome by Applicant's amendment.

4. The rejection of claims 23 under 35 U.S.C. 112, second paragraph, for lack of antecedent basis has been overcome by Applicant's cancellation of the claims.

5. The rejection of claim 27 under 35 U.S.C. 112, second paragraph, has been overcome by Applicant's amendment.

6. The rejections set forth in the immediately prior Office Action have been modified accordingly to address the amendment to the claims.

Claim Objections

7. Claims 27, 36, 37, 40 and 41 are objected to because of the following informalities:

a. In claim 27 at line 13, please change "is comprises" to --comprises--; and

b. In claims 36, 37, 40 and 41, the identifiers "stabilizer" and "absorber" have been switched. The compound identified in claims 36 and 40 is a UV light absorber, and the compound identified in claims 37 and 41 is a UV light stabilizer.

Appropriate correction is required.

Claim Rejections - 35 USC § 112

8. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

9. Claims 23 and 24 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 23 recites the limitation "a photovoltaic module of the type having an array" in line 1. The use of the word "type" is indefinite because it is not clear what is encompassed by the term. It is suggested that the phrase be changed --a photovoltaic module having an array--. The same applies to dependent claim 24.

Claim 23 recites the limitation "the properties set forth in Tables I and II" in line 9. The limitations provided in Tables I and II are indefinite because the ASTM test methods are not clearly defined. The ASTM test methods are standardized tests that are often used to measure physical properties. However, the tests are not definite because they can be altered over time. In order to positively identify the actual test that is used, the actual guidelines constituting the test must be provided in some form or the date at which the test measurements were based on should be identified. It is suggested that claim 23 be amended in a similar manner to the amendment of claim 27 filed on March 4, 2003, which incorporated the limitations of the tables into the body of the claim. The same applies to dependent claim 24.

Claim Rejections - 35 USC § 103

10. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

11. Claims 23 and 24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hanoka (U.S. Pat. No. 5,733,382), herein referred to as US '382, in view of Gonsiorawski et al. (U.S. Pat. No. 5,074,920), with evidence provided by the DuPont MSDS for Surlyn™ and the Performance Polymers Product Catalog, which can be found at http://www.perfformancepolymers.com/prdcatlgsearch.html.

Regarding claim 23, US '382 discloses a photovoltaic module comprising a plurality of photovoltaic cells **46** disposed between a transparent front panel **42** and a back sheet **50** and encapsulated by a light-transmitting zinc ionomer **44** and **48** (col. 5, lines 27-64; fig. 7). The zinc ionomer **44,48** is an ethylene-methacrylic acid copolymer or ethylene-acrylic acid copolymer (col. 7, lines 59-67). The zinc ionomer is resistant to acid chemical attack and has a melting point of about 95°C (physical properties of the material sold under the trade name Surlyn™ 1702 and 1650). The physical properties of Surlyn™ 1702 and 1650 are similar to the physical properties disclosed for Surlyn™ 1705-1 in Tables I and II of the instant specification. Furthermore, US '382 teaches, "various other ionomer products may also be used" (col. 8, lines 13-15). The photovoltaic cells **46** are connected by conductors **47** physically and electrically connected to front and back contacts using solder connections (col. 5, line 42). US '382 discloses using thin solar cells such as those taught by U.S. Pat. No. 5,478,402, which states, "amorphous silicon solar cells and other thin film solar cells are also known equivalents contemplated by this invention" (US '402 col. 1, lines 25-35). The encapsulating ionomer is modified by the addition of 0.5 wt.% Cyasorb 5411, a UV absorbing agent, and 0.5 wt.% Cyasorb 3346, a light stabilizer (col. 10, lines 13-18).

Regarding the use of CeO-free glass, the front support sheet **42** is made of clear transparent glass (col. 5, line 30). Since ceria-doped glass is more expensive, it is only used when UV absorption is required of the front protecting member, which is not necessary in US '382 due to the use of UV absorbers and stabilizers in the ionomer (col. 10, lines 13-18).

The solar cell module disclosed in US '382 differs from the instant invention because US '382 does not disclose the following:

a. Solder using an acidic flux, as recited in claim 23;

b. The ionomer absorbs no more than 0.3 wt% water, as recited in claims 24;

c. A melt flow index of 5.5, a melting point of 95°C, a Vicat softening point of 65°C, a freezing point of 61°C, and an ultimate tensile strength of 5300 psi (MD) and 5100 psi (TD), as recited in Table I referenced by claim 23;

Regarding claims 23, Gonsiorawski et al. disclose the use of "Xersin 2005" fluxing agent, which is comprised of "Pentoate", or mildly activated rosin flux because "they have been found to demonstrate superior thermal aging properties" (col. 4, lines 19-42).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the solder used in the module of US '382 to use a solder flux as taught by Gonsiorawski et al. because the solder flux has superior thermal aging properties.

Regarding claim 24, US '382 does not disclose the water absorption properties of the Surlyn™ 1702 and 1650. Since Surlyn™ 1702 and 1650 are similar to Surlyn™ 1705-1 and has similar physical properties, Surlyn™ 1702 and 1650 would be expected to have a similar water absorption property.

Regarding claim 23, Surlyn™ 1702 and 1650 have similar physical properties to Surlyn™ 1705-1, which has the physical properties listed in the instant claim. The

properties of the Surlyn™ resins are dependent on the molecular weight of each resin and the metal or metal salt added. Surlyn™ 1650, 1702 and 1705-1 are zinc ionomers. The DuPont MSDS for Surlyn™ shows that Surlyn™ 1705-1 is a synonym of Surlyn™ 1650 and 1702. From information obtained from the Performance Polymers Product Catalog, physical property data for Surlyn™ 1650, 1702 and 1705-1 is presented in Table I below.

Table I: Physical properties of Surlyn™ 1650, 1702 and 1705-1

	Surlyn™ 1650	Surlyn™ 1702	Surlyn™ 1705-1
Ion Type	Zinc	Zinc	Zinc
Melt Flow Index	1.55 dg/min	14.0 dg/min	5.50 dg/min
Melt Point	97.2°C	92.8°C	95.0°C
Vicat Softening Point	72.8°C	65.0°C	65.0°C
Density	0.950 g/cm^3	0.950 g/cm^3	0.950 g/cm^3
Tensile Strength (MD/TD)	5,500 psi/ 5,500 psi	3,600 psi/ 3,300 psi	5,300 psi/ 5,100 psi
Secant Modulus (MD/TD)	40,000 psi/ 40,000 psi	34,000 psi/ 30,000 psi	35,000 psi/ 34,000 psi

It would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the ionomer in the module of US '382 to use a resin such as Surlyn™ 1705-1 because the ionomers have similar properties and would

be expected to function equivalently. Since the physical properties of Surlyn™ 1705-1 have values which lie between the values of Surlyn™ 1650 and 1702, the compounds are chemical synonyms (DuPont MSDS), and US '382 teaches that "various other ionomer products may also be used", one skilled in the art would have had a reasonable expectation of success for the substitution of such similar materials as an encapsulant in a solar cell device.

12. Claims 27 and 38 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hanoka (U.S. Pat. No. 5,733,382), in view of Gonsiorawski et al. (U.S. Pat. No. 5,074,920) and Kamimura et al. (U.S. Pat. No. 6,262,358), with evidence provided by the DuPont MSDS for Surlyn™ and the Performance Polymers Product Catalog.

Regarding claims 27 and 38, US '382 discloses a photovoltaic module comprising a plurality of photovoltaic cells **46** disposed between a transparent front panel **42** and a back sheet **50** and encapsulated by a light-transmitting zinc ionomer **44** and **48** (col. 5, lines 27-64; fig. 7). The zinc ionomer **44,48** is an ethylene-methacrylic acid copolymer or ethylene-acrylic acid copolymer (col. 7, lines 59-67). The zinc ionomer is resistant to acid chemical attack and has a melting point of about 95°C (physical properties of the material sold under the trade name Surlyn™ 1702 and 1650). The physical properties of Surlyn™ 1702 and 1650 are similar to the physical properties disclosed for Surlyn™ 1705-1 in Tables I and II of the instant specification. Furthermore, US '382 teaches, "various other ionomer products may also be used" (col. 8, lines 13-15). The photovoltaic cells **46** are connected by conductors **47** physically

and electrically connected to front and back contacts using solder connections (col. 5, line 42). US '382 discloses using thin solar cells such as those taught by U.S. Pat. No. 5,478,402, which states, "amorphous silicon solar cells and other thin film solar cells are also known equivalents contemplated by this invention" (US '402 col. 1, lines 25-35). The encapsulating ionomer is modified by the addition of 0.5 wt.% Cyasorb 5411, a UV absorbing agent, and 0.5 wt.% Cyasorb 3346, a light stabilizer (col. 10, lines 13-18).

Regarding the use of CeO-free glass in claim 27, the front support sheet **42** is made of clear transparent glass (col. 5, line 30). Since ceria-doped glass is more expensive, it is only used when UV absorption is required of the front protecting member, which is not necessary in US '382 due to the use of UV absorbers and stabilizers in the ionomer (col. 10, lines 13-18).

The solar cell module disclosed in US '382 differs from the instant invention because US '382 does not disclose the following:

a. Solder using an acidic flux, as recited in claims 27 and 38;

b. The ionomer absorbs no more than 0.3 wt% water, as recited in claims 27 and 38;

c. A melt flow index of 5.5, a melting point of 95°C, a Vicat softening point of 65°C, a freezing point of 61°C, and an ultimate tensile strength of 5300 psi (MD) and 5100 psi (TD), as recited in claims 27 and 38;

d. The photovoltaic module exhibits no loss in electrical photovoltaic performance after 1000 hours of exposure to 85% RH/85°C damp heat

and after 20 cycles of change of conditions between 85% RH/85°C and 0%RH/-40°C, as recited in claims 27 and 38; and

e. The glass is transparent to radiation having a wavelength in the range of 400 to 800nm, as recited in claims 27 and 38.

Regarding claims 27 and 38, Gonsiorawski et al. disclose the use of "Xersin 2005" fluxing agent, which is comprised of "Pentoate", or mildly activated rosin flux because "they have been found to demonstrate superior thermal aging properties" (col. 4, lines 19-42).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the solder used in the module of US '382 to use a solder flux as taught by Gonsiorawski et al. because the solder flux has superior thermal aging properties.

Regarding claims 27 and 38, US '382 does not disclose the water absorption properties of the Surlyn™ 1702 and 1650. Since Surlyn™ 1702 and 1650 are similar to Surlyn™ 1705-1 and has similar physical properties, Surlyn™ 1702 and 1650 would be expected to have a similar water absorption property.

Surlyn™ 1702 and 1650 have similar physical properties to Surlyn™ 1705-1, which has the physical properties listed in the instant claim. The properties of the Surlyn™ resins are dependent on the molecular weight of each resin and the metal or metal salt added. Surlyn™ 1650, 1702 and 1705-1 are both zinc ionomers. The DuPont MSDS for Surlyn™ shows that Surlyn™ 1705-1 is a synonym of Surlyn™ 1650

and 1702. From information obtained from the Performance Polymers Product Catalog, physical property data for Surlyn™ 1650, 1702 and 1705-1 is presented in Table I above.

It would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the ionomer in the module of US '382 to use a resin such as Surlyn™ 1705-1 because the ionomers have similar properties and would be expected to function equivalently. Since the physical properties of Surlyn™ 1705-1 have values which lie between the values of Surlyn™ 1650 and 1702, the compounds are chemical synonyms (DuPont MSDS), and US '382 teaches that "various other ionomer products may also be used", one skilled in the art would have had a reasonable expectation of success for the substitution of such similar materials as an encapsulant in a solar cell device.

Regarding the wavelength transmission spectrum recited in claims 27 and 38, Kamimura et al. teach the formation of an encapsulated solar cell module using a glass protective cover sheet **11** to protect the underlying solar cells **13**, wherein the glass cover sheet **11** is "preferably made of a material which...efficiently transmits light having wavelengths suiting the sensitivity of the solar cells (for example, light with wavelengths of 0.35 μm [350 nm] to 1.2 μm [1200 nm])" (fig. 1; col. 3, lines 46-53).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the glass cover in the photovoltaic module described by US '382 to use a glass cover sheet that efficiently transmits light having

wavelengths "suiting the sensitivity of the solar cells", such as the range between 400 nm and 800 nm, as taught by Kamimura et al. because such a glass cover would maximize the efficiency of the solar cells by allowing the proper wavelengths to reach the solar cells.

Regarding the limitation, wherein "the photovoltaic module exhibits no loss in electrical photovoltaic performance after 1000 hours of exposure to 85% RH/85°C damp heat and after 20 cycles of change of conditions between 85% RH/85°C and 0%RH/-40°C", the limitation does not provide any additional structural limitation to the claim but recites a result of the structure. Since the photovoltaic module described by US '382, Gonsiorawski et al. and Kamimura et al. has the same structure as the device of the instant invention and also is made using the same materials, the device described by the prior art would also be expected to perform in a similar manner.

13. Claim 29 is rejected under 35 U.S.C. 103(a) as being unpatentable over Hanoka (U.S. Pat. No. 5,733,382), in view of Gonsiorawski et al. (U.S. Pat. No. 5,074,920) and Kamimura et al. (U.S. Pat. No. 6,262,358), with evidence provided by the DuPont MSDS for Surlyn™ and the Performance Polymers Product Catalog, as applied above to claims 27 and 38, and further in view of in view of Hanoka (U.S. Pat. No. 6,320,116), herein referred to as US '116.

US '382, Gonsiorawski et al. and Kamimura et al. describe a photovoltaic module having the limitations recited in claims 27 and 38, as explained above in section 12. US

'382 discloses using thin solar cells such as those taught by U.S. Pat. No. 5,478,402, which states, "amorphous silicon solar cells and other thin film solar cells are also known equivalents contemplated by this invention" (US '402 col. 1, lines 25-35).

The module described by US '382, Gonsiorawski et al. and Kamimura et al. differs from the instant invention because they do not disclose the use of monolithic connections.

US '116 discloses a photovoltaic module using encapsulated photovoltaic cells, wherein the cells are connected using a monolithic connections (col. 3, lines 4-8).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the connections described by US '382, Gonsiorawski et al. and Kamimura et al. to use monolithic connectors as taught by US '116 because using monolithic connectors would simplify the fabrication of the photovoltaic modules.

14. Claim 30 is rejected under 35 U.S.C. 103(a) as being unpatentable over Hanoka (U.S. Pat. No. 5,733,382), in view of Gonsiorawski et al. (U.S. Pat. No. 5,074,920), Kamimura et al. (U.S. Pat. No. 6,262,358) and Hanoka (U.S. Pat. No. 6,320,116), with evidence provided by the DuPont MSDS for Surlyn™ and the Performance Polymers Product Catalog, as applied above to claim 29, and further in view of in view of Hanoka et al. (U.S. Pat. No. 6,353,042), herein referred to as US '042.

US '382, Gonsiorawski et al., Kamimura et al. and US '116 describe a photovoltaic module having the limitations recited in claim 29, as explained above in section 13.

The module described by US '382, Gonsiorawski et al., Kamimura et al. and US '116 differs from the instant invention because they do not disclose the use of cadmium telluride and CIGS cells, as recited in claim 30.

US '042 discloses an encapsulated photovoltaic module using thin film cells comprised of materials such as amorphous silicon, CIGS or cadmium telluride (col. 6, lines 19-59).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified semiconductor layer in the photovoltaic module described by US '382, Gonsiorawski et al., Kamimura et al. and US '116 to use thin film cells or cells made from CIGS or cadmium telluride, as taught by US '042, because thin film CIGS and cadmium telluride photovoltaic cells are capable of producing energy using sunlight in a manner equivalent to amorphous silicon.

15. Claims 36 and 37 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hanoka (U.S. Pat. No. 5,733,382), in view of Gonsiorawski et al. (U.S. Pat. No. 5,074,920) and Kamimura et al. (U.S. Pat. No. 6,262,358), with evidence provided by the DuPont MSDS for Surlyn™ and the Performance Polymers Product Catalog, as applied above to claims 27 and 38, and further in view of in view of Mientus et al. (U.S. Pat. No. 6,106,982).

US '382, Gonsiorawski et al. and Kamimura et al. describe a photovoltaic module having the limitations recited in claims 27 and 38, as explained above in section 12. AS explained above, US '382 teaches that the encapsulating ionomer is modified by the addition of 0.5 wt.% Cyasorb 5411, a UV absorbing agent, and 0.5 wt.% Cyasorb 3346, a light stabilizer (col. 10, lines 13-18).

The photovoltaic module described by US '382, Gonsiorawski et al. and Kamimura et al. differs from the instant invention because they do not disclose the use of a UV light absorber comprising the compound sold under the tradename Tinuvin™ 328, as recited in claim 36, and a UV light stabilizer sold under the tradename Chimassorb™ 944, as recited in claim 37.

Mientus et al. disclose the modification of ionomers including Surlyn™ 1650, 1702 and 1705-1 with stabilizers such as Chimassorb™ 944 and UV light absorbers including Tinuvin™ 328 at a range of up to 2.5% by weight (col. 18, lines 8-61 and col. 19, lines 11-30). Mientus et al. also disclose the use of stabilizers including Cyasorb™ in addition to Tinuvin™ and Chimassorb™ (col. 11, lines 29-33).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the stabilizer and absorber used in the photovoltaic device described by US '382, Gonsiorawski et al. and Kamimura et al. to use the compounds sold under the tradenames Tinuvin™ 328 and Chimassorb™ 944, as taught by Mientus et al. because Mientus et al. discloses that such absorbers and stabilizers are equivalent to the line of absorbers and stabilizers used by US '382, and

the use of equivalent materials for there intended purpose would have been obvious to one skilled in the art.

16. Claim 39 is rejected under 35 U.S.C. 103(a) as being unpatentable over Hanoka (U.S. Pat. No. 5,733,382) in view of Gonsiorawski et al. (U.S. Pat. No. 5,074,920), French (U.S. Pat. No. 4,287,382) and Pern (U.S. Pat. No. 6,093,757), with evidence provided by the DuPont MSDS for Surlyn™ and the Performance Polymers Product Catalog.

US '382 discloses a method for forming a photovoltaic module comprising the following steps (col. 7, lines 21-45):

a. Providing an array of interconnected silicon solar cells **46** on top of the sheet **44**, wherein each photovoltaic cell **46** has a front light-receiving surface and a rear surface with contacts **47** attached to the front and rear surfaces and soldered into place;

b. Providing front and back support sheets **42, 50**, wherein the sheets are transparent and stiff;

c. Placing an ionomer encapsulating sheet **44** over front glass plate **42**, the ionomer sheet **44** has a melting point of about 95°C;

d. Placing the array of interconnected solar cells **46** on sheet **44**;

c. Placing a second ionomer encapsulating sheet **48** on the interconnected array of solar cells **46**;

d. Placing a back support sheet **50** on the second ionomer encapsulating sheet **48**;

e. Heating the module **40** in a heated vacuum press to "melt or at least soften...the various surfaces"; and

f. Cooling the module to bond the adjacent components.

Regarding the temperature range recited, US '382 teaches, "the resulting sandwich is heated under vacuum to a suitable temperature" and the module **40** is heated in a vacuum press to "melt or at least soften...the various surfaces" (col. 9, lines 21-27; col. 7, lines 39-45).

Regarding the physical properties of the ionomer, Surlyn™ 1705-1 would be expected to have similar water absorption properties as Surlyn™ 1702 and 1650 since they are zinc ionomers having other similar physical properties as shown above in Table I. The DuPont MSDS for Surlyn™ shows that Surlyn™ 1705-1 is a synonym of Surlyn™ 1650 and 1702. From information obtained from the Performance Polymers Product Catalog, physical property data for Surlyn™ 1650, 1702 and 1705-1 is presented in Table I below. Furthermore, US '382 teaches, "various other ionomer products may also be used" (col. 8, lines 13-15).

Regarding the use of CeO-free glass, the front support sheet **42** disclosed by US '382 is made of clear and transparent glass (col. 5, line 29). Ceria-doped glass, a more expensive alternative, is only used when UV absorption is required of the front support, which is not the case in the module of US '382 that uses UV absorbers and UV stabilizers added to the ionomer encapsulant (col. 10, lines 13-18).

Regarding the use of stabilizers and UV absorbers, US '382 teaches that the encapsulating ionomer is modified by the addition of 0.5 wt.% Cyasorb 5411, a UV absorbing agent, and 0.5 wt.% Cyasorb 3346, a light stabilizer (col. 10, lines 13-18).

The method disclosed in US '382 differs from the instant invention because US '382 does not explicitly disclose a method containing the following limitations:

a. Acidic flux is used;

b. A melt flow index of 5.5, a melting point of 95°C, a Vicat softening point of 65°C, a freezing point of 61°C, and an ultimate tensile strength of 5300 psi (MD) and 5100 psi (TD);

c. The temperature is 120°C-130°C and the pressure is 390-400 torr;

d. A scrim layer is inserted immediately following the layer of solar cells.

Gonsiorawski et al. disclose the use of "Xersin 2005" fluxing agent, which is comprised of "Pentoate", or mildly activated rosin flux because "they have been found to demonstrate superior thermal aging properties" (col. 4, lines 19-42).

French discloses a method for producing a solar cell module wherein a scrim layer is inserted between the encapsulating sheets "in an attempt to provide for complete removal of air prior to the lamination of the sheets of encapsulant" so bubbles do not form in the finished product (col. 1, lines 53-62).

Pern discloses a method for forming an encapsulated solar cell module and states, "conventional lamination procedures generally require about 8-10 minutes at 120°C" (col. 4, lines 34-38).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the solder used in the module of US '382 to use a solder flux as taught by Gonsiorawski et al. because the solder flux has superior thermal aging properties.

It would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the method of US '382 to use a scrim sheet, as taught by French, because using a scrim sheet would "provide for complete removal of air prior to the lamination of the sheets of encapsulant" (col. 1, lines 53-62).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the temperature used in the method of US '382 to use a temperature of about 120°C to 130 °C and a pressure appropriate for the processing of zinc ionomer as taught by Pern because such a temperature and pressure would sufficiently soften the ionomer of US '382 (melting point ~95°C) while reducing the cost to heat the module to higher temperatures.

It would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the ionomer in the module of US '382 to use a resin such as Surlyn™ 1705-1 because the ionomers have similar properties and would be expected to function equivalently. Since the physical properties of Surlyn™ 1705-1 have values which lie between the values of Surlyn™ 1650 and 1702, the compounds are chemical synonyms (DuPont MSDS), and US '382 teaches that "various other ionomer products may also be used", one skilled in the art would have had a reasonable

expectation of success for the substitution of such similar materials as an encapsulant in a solar cell device.

17. Claims 40 and 41 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hanoka (U.S. Pat. No. 5,733,382) in view of Gonsiorawski et al. (U.S. Pat. No. 5,074,920), French (U.S. Pat. No. 4,287,382) and Pern (U.S. Pat. No. 6,093,757), with evidence provided by the DuPont MSDS for Surlyn™ and the Performance Polymers Product Catalog, as applied above to claim 39, and further in view of Mientus et al. (U.S. Pat. No. 6,106,982).

US '382, Gonsiorawski et al., French and Pern describe a method for making a photovoltaic module having the limitations recited in claim 39 of the instant invention, as explained above in section 16.

The method described by US '382, Gonsiorawski et al., French and Pern differs from the instant invention because they do not disclose the use of a UV light absorber comprising the compound sold under the tradename Tinuvin™ 328, as recited in claim 40, or the UV light stabilizer consisting of the compound sold under the tradename Chimassorb™ 944, as recited in claim 41.

Mientus et al. disclose the modification of ionomers including Surlyn™ 1650, 1702 and 1705-1 with stabilizers such as Chimassorb™ 944 and UV light absorbers including Tinuvin™ 328 at a range of up to 2.5% by weight (col. 18, lines 8-61 and col. 19, lines 11-30). Mientus et al. also disclose the use of stabilizers including Cyasorb™ in addition to Tinuvin™ and Chimassorb™ (col. 11, lines 29-33).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the stabilizer and absorber used in the photovoltaic device described by US '382, Gonsiorawski et al., French and Pern to use the compounds sold under the tradenames Tinuvin™ 328 and Chimassorb™ 944, as taught by Mientus et al. because Mientus et al. discloses that such absorbers and stabilizers are equivalent to the line of absorbers and stabilizers used by US '382, and the use of equivalent materials for there intended purpose would have been obvious to one skilled in the art.

Response to Arguments

18. Applicant's arguments with respect to claims 1-22 have been considered but are not persuasive.

19. Regarding the rejection of claims 23 and 27 for indefiniteness due to the recitation of the ASTM test methods, the rejection is made not because the test methods may have changed since the filing of the application, but because the test methods can change in the future, so a value obtained under the current test might not be obtained under the same test number in the future. The rejection can be overcome by stating the date at which the test methods were used, which identifies the exact method, or by incorporating the structural limitations recited in Tables I and II of the instant specification into the body of the claim.

20. Regarding the rejection of the claims based on the reference of US '382, Applicant has argued, "the behavior of performance of the 1705-1 ionomer as an

encapsulant for solar cells cannot be predicted from the 1702 ionomer" (see page 10 of Applicant's response). This argument is not persuasive because there is sufficient motivation in the prior art of record to use another ionomer, particularly Surlyn™ 1705-1. US '382 teaches, "various other ionomer products may also be used" in addition to Surlyn™ 1650 and 1702, which are explicitly disclosed (col. 8, lines 13-15). As shown above in Table I, the values of the physical properties of Surlyn™ 1705-1 lie between the values of Surlyn™ 1650 and 1702. Since both of these compounds are known to be used in photovoltaic modules with success, it would have been obvious to one having ordinary skill in the art that a compound having physical properties that are contained within the range spanned by the materials of the explicit examples would also function with success. Furthermore, the DuPont MSDS for Surlyn™ shows that Surlyn™ 1705-1 is a synonym of Surlyn™ 1650 and 1702.

21. Applicant further suggests that because Exhibit D, derived from DuPont and entitled "SURLYN® thermoplastic resin" reveals "that the properties of Surlyn™ ionomers can vary widely" (see page 11 of Applicant's response). As explained above, Surlyn™ 1650 and 1702, which are zinc ionomers explicitly disclosed by US '382, provide a range of physical property values that contains the physical property values of Surlyn™ 1705-1. Since the physical property values of Surlyn™ 1705-1 are within the outer ranges of the values known to be successful for use as solar cell encapsulants, one skilled in the art would have had a reasonable expectation of success for using such a similar compound.

22. Regarding claims 36 and 37 (and likewise claims 40 and 41), Applicant states, "the discovery that the particular stabilizer and absorber compounds listed in claims 36 and 37 will provide the desired results is not obvious" (see page 11 of Applicant's response). As explained above, the specified compounds are known for use with Surlyn™ 1650, 1702 and 1705-1, as taught by Mientus et al. Therefore, the use of these compounds in a zinc ionomer is not a novel use.

23. Applicant further states, "what is addressed for the first time by this invention, is the fact that acidic flux reactions with ionomer encapsulants can shorten the useful life and reduce performance of photovoltaic modules, and also that such reactions can be substantially avoided or reduced to a negligible level by using a zinc ionomer as the encapsulant" (see page 12 of Applicant's response; emphasis added by Applicant). The identification of a property of a device is not a patentable invention. The use of zinc ionomers is known in the art (US '382), and motivation for using other zinc ionomers also exists, as explained above. Therefore, the fact that the Applicant has identified a property of using the claimed device lacks novelty because the device described by the prior art references would be expected to function in the same manner due to their structural and material similarities.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Brian L. Mutschler whose telephone number is (703)

305-0180. The examiner can normally be reached on Monday-Friday from 8:00am to 4:30pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nam Nguyen can be reached on (703) 308-3322. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 872-9310 for regular communications and (703) 872-9311 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0661.

blm
March 27, 2003

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SUPERVISORY PATENT EXAMINER
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